Z Test Hypothesis Testing

A z-test is a statistical test used to determine whether two population means are different when the variances are known and the sample size is large. It can also be used to compare one mean to a hypothesized value.

The z-test is also a hypothesis test in which the z-statistic follows a normal distribution. The z-test is best used for greater-than-30 samples because, under the central limit theorem, as the number of samples gets larger, the samples are considered to be approximately normally distributed.

Formula

$$z = \frac{X - \mu}{\sigma}$$

Example

A company claims that the average battery life of their new smartphone is 12 hours. A consumer group tests 100 phones and finds the average battery life to be 11.8 hours with a population standard deviation of 0.5 hours. At a 5% significance level, is there evidence to refute the company's claim?

Step 1: State the hypotheses

$$H_0 : \mu = 12$$
$$H_1 : \mu \neq 12$$

Step 2: Calculate the Z-score

$$z = \frac{X - \mu}{\frac{\sigma}{\sqrt{n}}}$$
$$z = \frac{11.8 - 12}{\frac{0.5}{\sqrt{100}}}$$
$$z = -4$$

Step 3: Find the critical value (two-tailed test at 5% significance)

$$z_{0.025} = \pm 1.96$$

Step 4: Compare Z-score with critical value

|-4| > 1.96, so we reject the null hypothesis.